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# WATER SUPPLY OUTLOOK FOR MONTANA

Prepared by

## U. S. DEPARTMENT of AGRICULTURE ★ SOIL CONSERVATION SERVICE

Collaborating with

MONTANA AGRICULTURAL EXPERIMENT STATION

Data included in this report were obtained by the agencies named above in cooperation with Federal, State, and private organizations listed on the inside back cover of this report.

SNOW PILLOW RECORDS 1972 WATER YEAR

### TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1900 snow courses in Western United States and in the Columbia Basin in British Columbia. Networks of automatic snow water equivalent and related data sensing devices, along with radio telemetry are expanding and will provide a continuous record of snow water and other parameters of key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

COVER PHOTO NUMBER ORC 221-3

### PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, Western Regional Technical Service Center, Room 209, 701 N. W. Glisan, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	P. O. Box "F", Palmer, Alaska 99645
Arizona	6029 Federal Building, Phoenix, Arizona 85025
Colorado (N. Mex.)	P. O. Box 17107, Denver, Colorado 80217
Idaho	Room 345, 304 N. 8th. St., Boise, Idaho 83702
Montana	P. O. Box 970, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevada 89505
Oregon	1218 S. W. Washington St., Portland, Oregon 97205
Utah	4012 Federal Bldg., 125 South State St., Salt Lake City, Utah 84111
Washington	360 U.S. Court House, Spokane, Washington 99201
Wyoming	P. O. Box 2440, Casper, Wyoming 82601

CONSERVATION OF WAT

### PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P.O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia

# WATER SUPPLY OUTLOOK FOR MONTANA

and FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

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# MONTANA FALL SUMMARY October 1, 1972

### COLUMBIA RIVER BASIN

Streamflow during the spring and summer months was above average in the northern drainages, and well above average in the Blackfoot, Bitterroot and upper Clark Fork drainages. These above average volumes are a result of the large snowpack accumulation during the winter months.

Spring and summer precipitation at valley stations was a little below average in the Flathead drainages, below average in the Bitterroot and upper Clark Fork areas, and near to above average in the Kootenai drainage.

Recent precipitation was helpful in recharging mountains soils. Reservoir storage is generally near to above average.

### MISSOURI RIVER BASIN

Nearly all of the Missouri River drainages had above average runoff for the April through September period. Streamflow in the southwestern drainages of the Jefferson and Madison Rivers was well above average, reflecting the melting of a heavy winter snowpack. Seasonal valley precipitation was generally near to below average in these drainages with more favorable moisture conditions in the easterly drainages.

Generally, mountain soils have a good moisture content as a result of adequate fall precipitation. Nearly all irrigation reservoirs have near to above average storage.

### YELLOWSTONE RIVER BASIN

April through September runoff in nearly all Yellowstone River drainages was above average. A good high elevation snowpack sustained late season flows.

Mountain soils generally contain a normal amount of moisture. Seasonal precipitation at valley stations was generally near to above average in the Yellowstone River headwaters. Well above average amounts were recorded downstream.



Profile (Inches)

Date of

Soil Moisture (Inches)

DRAINAGE BASIN and/or STATION

Name	Elevation	Depth	Capacity	Survey	This Year	Last Year	Average +
	COLUMBIA	RIVER	BASTN				
	0010110111	REVER	DITOLIK				
Kootenai							
Baree Trail	3800	48	7.5	7/01			5.3
Murphy Lake R. S.	3000	48	22.6	-		19.9	20.4
Raven R. S.	3050	48	23.0	7/01	13.6	14.7	18.7
Flathead							
Desert Mountain	5600	54	8.4				8.6
Marias Pass	5250	54	6.5	6/30	6.7	6.0	5.4
Clark Fork							
Black Pine	7100	48	10.0	6/29	8.7	8.7	8.9
Lubrecht Forest	4100	48	26.8		-	**	-
Seeley Lake R. S.	4030	48	11.9	•	9.6	-	-
Skalkaho Summit	7260	48	10.8	6/29	9.4	10.0	10.2
Bitterroot							
Gibbons Pass	7100	48	7.1	•	6.3		6.5
Lolo Pass	5250	48	10.6	6/26	9.9	9.9	9.6
	MTCCOUDT	חדווכה	DACTN				
	MISSOURI	RIVER	DASIN				
Beaverhead							
Lakeview	6700	48	15.3	7/02	15.7	16.2	13.5
Madison							
West Yellowstone	6700	48	6.5	7/02	2.9	3.0	3.0
Gallatin							
Bridger Bowl	7250	48	17.0	•	15.8		16.3
College Site No. 2	4856	54	17.7			13.4	
Lick Creek	6860	48	18.8			17.5	
Twenty-One Mile	7150	48	10.0	7/02	9.0	9.7	8.7
Missouri Main Stem							
Kings Hill	7420	48	11.8	-			10.8
Stemple Pass	6350	48	5.9	6/30	4.7	4.8	5.1
Milk	0070	4.0				10.0	
Beaver Creek	3950	48	20.9				
Rocky Boy	4700	36	10.1	6/26	7.7	9.0	-
Yellowstone Rettle Pide	(000	4.0	17.	( 100	10.0	16.1	15 1
Battle Ridge	6020	48	17.6	•	12.9		15.1
Northeast Entrance	7350	48	9.4	6/30	8.7	7.7	9.0

<sup>-2-</sup>



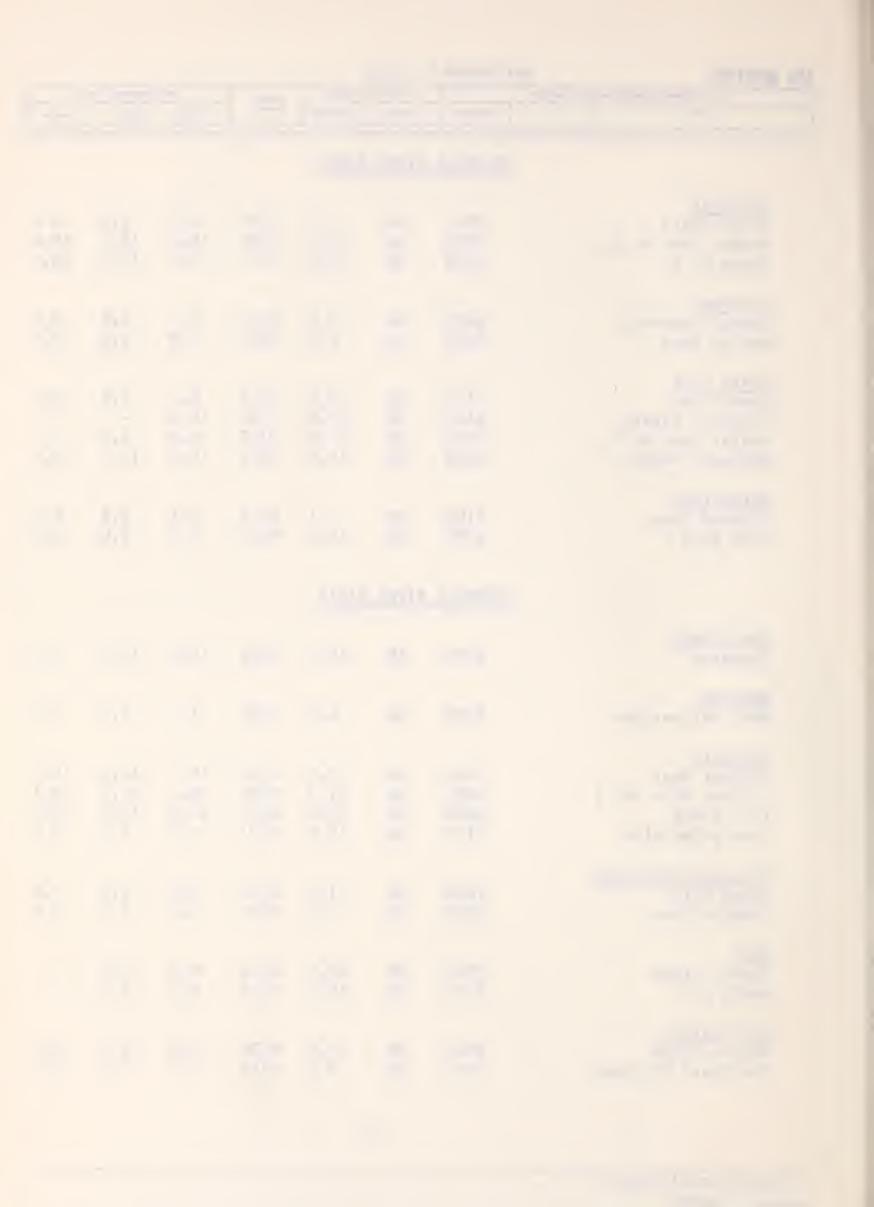
DRAINAGE BASIN and/or STATION

AUGUST 1, 1972

Profile (Inches)

Soil Moisture (Inches)

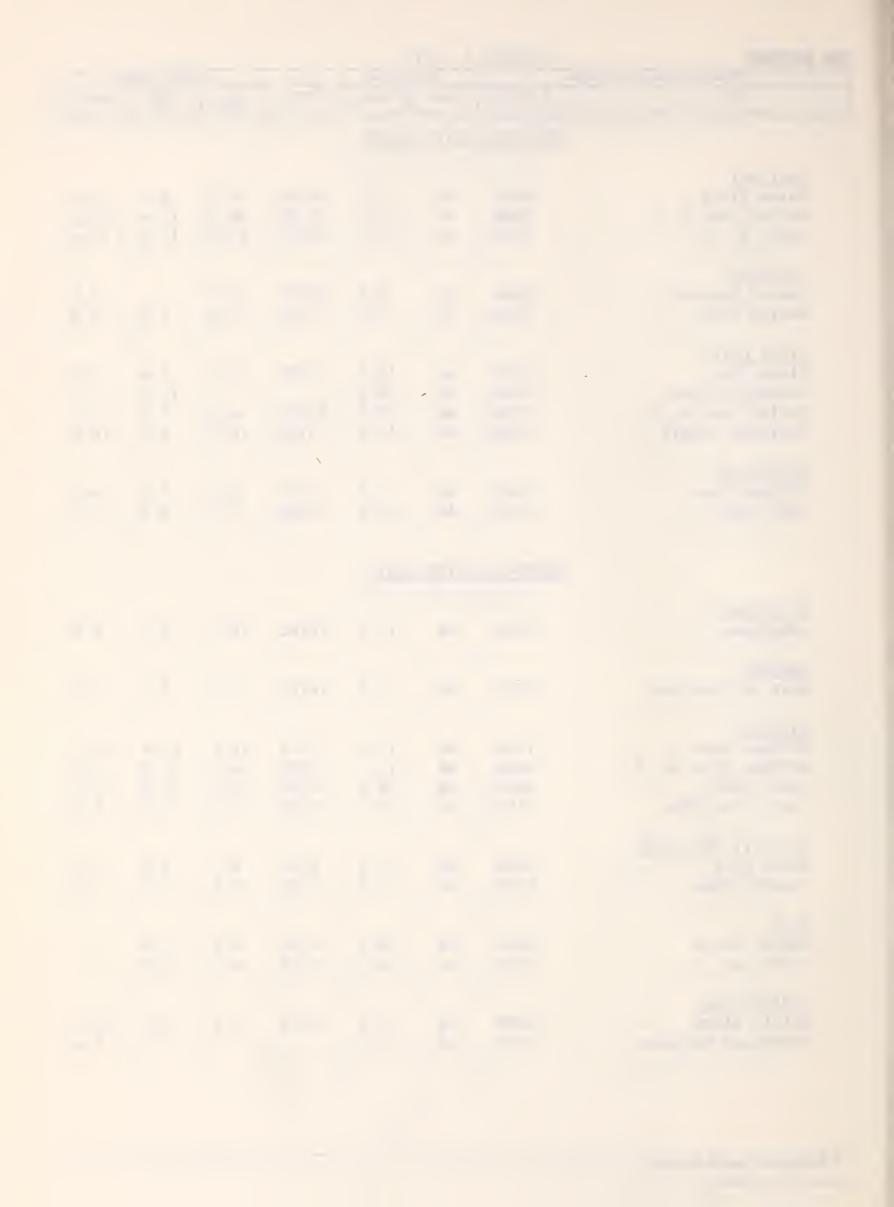
Name	Elevation	Depth	Capacity	Date of Survey	This Year	Last Year	Average +
	COLUMBIA	RIVER	BASIN				
Kootenai							
Baree Trail	3800	48	7.5	8/01	4.2	4.1	-
Murphy Lake R. S.	3000	48	22.6	8/01	19.0	19.0	18.9
Raven R. S.	3050	48	23.0			13.2	17.2
Flathead							
Desert Mountain	5600	54	8.4	8/01	7.1	6.7	6.5
Marias Pass	5250	54	6.5	7/27	6.8	4.8	4.0
Clark Fork							
Black Pine	7100	48	10.0	7/28	8.5	8.0	8.6
Lubrecht Forest	4100	48	26.8			-	- '
Seeley Lake R. S.	4030	48	11.9	8/01	7.0	-	-
Skalkaho Summit	7260	48	10.8	7/28	10.4	10.5	10.3
Bitterroot							
Gibbons Pass	7100	48	7.1	7/28	4.6	4.3	5.1
Lolo Pass	5250	48	10.6	7/27	7.0	5.9	5.9
	MISSOURI	RIVER	BASIN				
Beaverhead							
Lakeview	6700	48	15.3	8/01	13.8	16.7	9.2
Madison							
West Yellowstone	6700	48	6.5	8/03	1.9	2.0	-
Gallatin							
Bridger Bowl	7250	48	17.0	7/31	15.7	16.0	15.6
College Site No. 2	4856	54	17.7		- 11.5		
Lick Creek	6860	48	18.8		15.0		
Twenty-One Mile	7150	48	10.0	8/03			5.6
Missouri Main Stem							
Kings Hill	7420	48	11.8	8/01	9.5	8.9	9.1
Stemple Pass	6350	48	5.9	8/03	4.0		4.1
Milk							
Beaver Creek	3950	48	20.9	7/21	7.9	6.3	-
Rocky Boy	4700	36	10.1	7/21		6.7	~
Yellowstone							
Battle Ridge	6020	48	17.6	7/31	11.4	12.8	11.4
Northeast Entrance	7350	48	9.4			5.5	6.7



OCTOBER 1, 1972

Profile (Inches)

DRAINAGE BASIN and/or STATION		Profile (Inches)		Date of	Soil Moisture (Inches)		
Name	Elevation	Depth	Capacity	Survey	This Year	Last Year	Average +
<u>CC</u>	DLUMBIA	RIVER	BASIN				
77							
Kootenai Baree Trail	3800	48	7.5	10/02	/, 7	4.8	5.2
Murphy Lake R. S.	3000	48	22.6	-			
Raven R. S.	3050	48	23.0	-			17.6
Ravell R. S.	3030	40	23.0	10/02	13.3	13.1	17.0
Flathead							
Desert Mountain	5600	54	8.4	10/02	5.9	_	5.8
Marias Pass	5250	54	6.5	9/26		3.6	3.9
				.,			
Clark Fork							
Black Pine	7100	48	10.0	9/28	8.3	7.6	7.9
Lubrecht Forest	4100	48	26.8			13.3	-
Seeley Lake R. S.	4030	48	11.9	10/02	4.0	3.9	4.3
Skalkaho Summit	7260	48	10.8	9/28	10.2	9.7	10.2
					•		
<u>Bitterroot</u>							
Gibbons Pass	7100	48	7.1	9/29			
Lolo Pass	5250	48	10.6	9/28	3.7	2.9	4.7
247		DIVED	DAGEN				
<u>M</u> .	SSOURI	KIVEK	BASIN				
Beaverhead							
Lakeview	6700	48	15.3	10/02	14.4	13.1	6.8
Lakeview	0700	40	17.5	10/02	14.4	13.1	0.0
Madison							
West Yellowstone	6700	48	6.5	10/05	3.4	2.5	2.4
Ness Tellowscome	0,00			10,03	3.1	- 0 3	
Gallatin							
Bridger Bowl	7250	48	17.0	9/25	15.8	15.9	15.8
College Site No. 2	4860	48	17.7	9/29	10.1	15.2	9.9
Lick Creek	6860	48	18.8	9/28	12.1	15.9	17.0
Twenty-One Mile	7150	48	10.0	10/05	7.6	6.2	4,2
Missouri Main Stem							
Kings Hill	7420	48	11.8	9/27	8.7	5.2	7.2
Stemple Pass	6350	48	5.9	9/29	3.5	3.9	3.8
24.11							
Milk	2050	/ 0	20.0	0./00		( )	
Beaver Creek	3950	48	20.9	9/29	6.6	6.0	-
Rocky Boy	3950	36	10.1	9/29	6.7	6.2	-
Vallagatana							
Yellowstone Battle Ridge	6020	48	17.6	9/25	7.5	8.2	10.3
Northeast Entrance	7350	48	9.4	9145	/ • )	-	6.4
Notenease Billiance	, 550	70	J • <del>'</del>			_	0.4



## RESERVOIR STORAGE (Thousand Acre Feet) END OF MONTH

Basin or Stream	RESERVOIR	Usable			
		Capacity	This Year	Last Year	Average
COLUMBIA RIVER BA	SIN				
Kootenai	Koocanusa	4,965.0	2,844.0	-	-
lathead	Hungry Horse	3,428.0	3,332.0	3,241.0	3,331.0
	Flathead Lake	1,791.0	1,785.0	1,702.0	1,699.0
	Camas (4)	45.2	29.7	24.2	24.9
	Mission Valley (8)	100.3	20.0	18.3	17.
Clark Fork	Georgetown Lake	31.0	30.0	30.0	26.
	Nevada Creek	12.6		2.6	6.
	Noxon Rapids	334.6	325.9	320.5	321.
Bitterroot	Como	34.9	7 - 2 7 7	3.8	1.
710001	Painted Rocks	31.7	28.5	28.0	25
MISSOURI RIVER BA	SIN				
Beaverhead	Clark Canyon	328.0	131.5	137.3	103.0
	Lima	84.0	41.0	42.7	17.
Ruby	Ruby	38.8	13.7	13.7	8.
Madison	Hebgen Lake	377.5	357.5	320.9	299.
	Ennis Lake	41.0	27.2	38.4	36.
Gallatin	Middle Creek	8.0	2.5	2.6	2.
Missouri	Canyon Ferry	3,043.0	1,617.0		
IID BOOT I	Hauser & Helena	61.9	63.0	61.3	58.
	Lake Helena	10.4	10.9	10.2	9.
	Holter Lake	81.9	81.1	63.5	75.
	Smith River	10.7	7.7	3.7	
					5.
	Bair (Durand)	7.0	1.6		3.
	Martinsdale	23.1			6.
	Deadman's Basin	72.2			
	Fort Peck		17,510.0		
Sun	Gibson	105.0			
	Willow Creek	32.3			
	Pishkun	32.0	17.9	19.0	
larias	Lower Two Medicine			-	3.
	Four Horns	19.2		-	11.
	Swift	30.0	19.8	17.0	13.
	Lake Frances	112.0	95.3	64.1	83.
	Tiber	1,347.0	590.7	533.8	689.0
ľilk	Fresno	127.2	74.9	37.4	67.8
	Nelson	66.8		33.9	44.
	Lake Sherburne	66.1	15.7		
Yellowstone	Mystic Lake	20.8			
	Tongue River	68.0			20.6
	Cooney	27.5			
Big Horn	Big Horn Lake		1,069.0		
	279 HOTH Dake	1,000.0	1,000,0	1,0/0.0	_

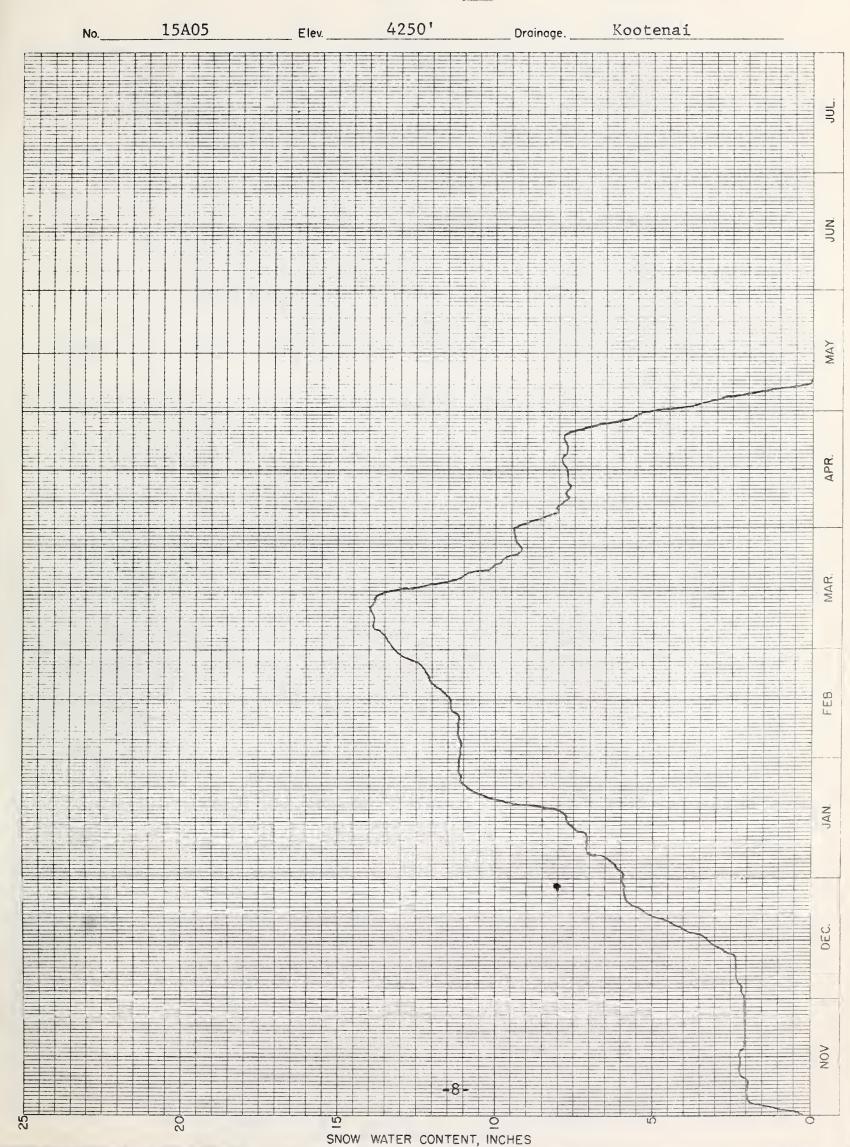


15A08 5600' SNOW WATER CONTENT, INCHES



# SNOW PILLOW DATA WATER YEAR 1972

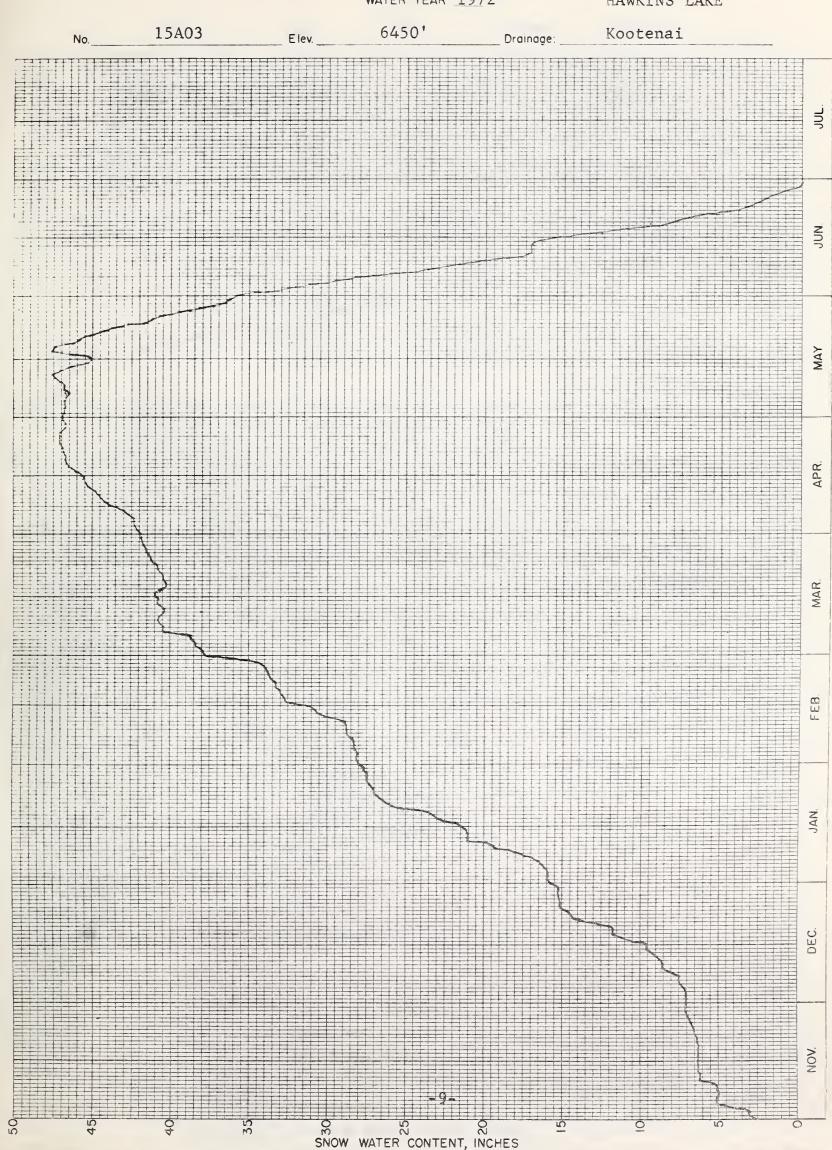
GARVER CREEK





SNOW PILLOW DATA WATER YEAR 1972

HAWKINS LAKE





15A12 5100' Kootenai Drainage: \_ NOV. SNOW WATER CONTENT, INCHES



63001 13A19 Flathead Elev. \_\_\_\_ Drainage: \_\_\_ -11-SNOW WATER CONTENT, INCHES



SNOW PILLOW DATA WATER YEAR 1972

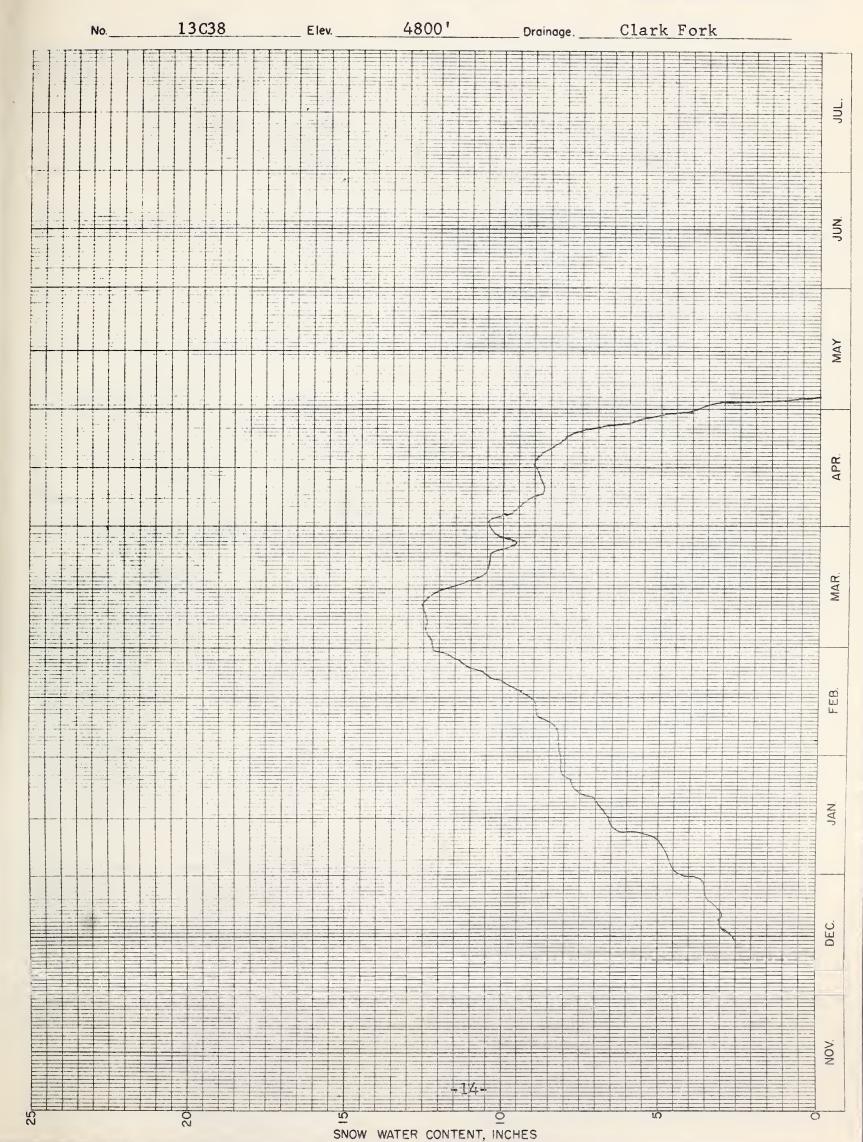
BLACK PINE

7100' 13C13 Clark Fork Elev. Drainage: SNOW WATER CONTENT, INCHES

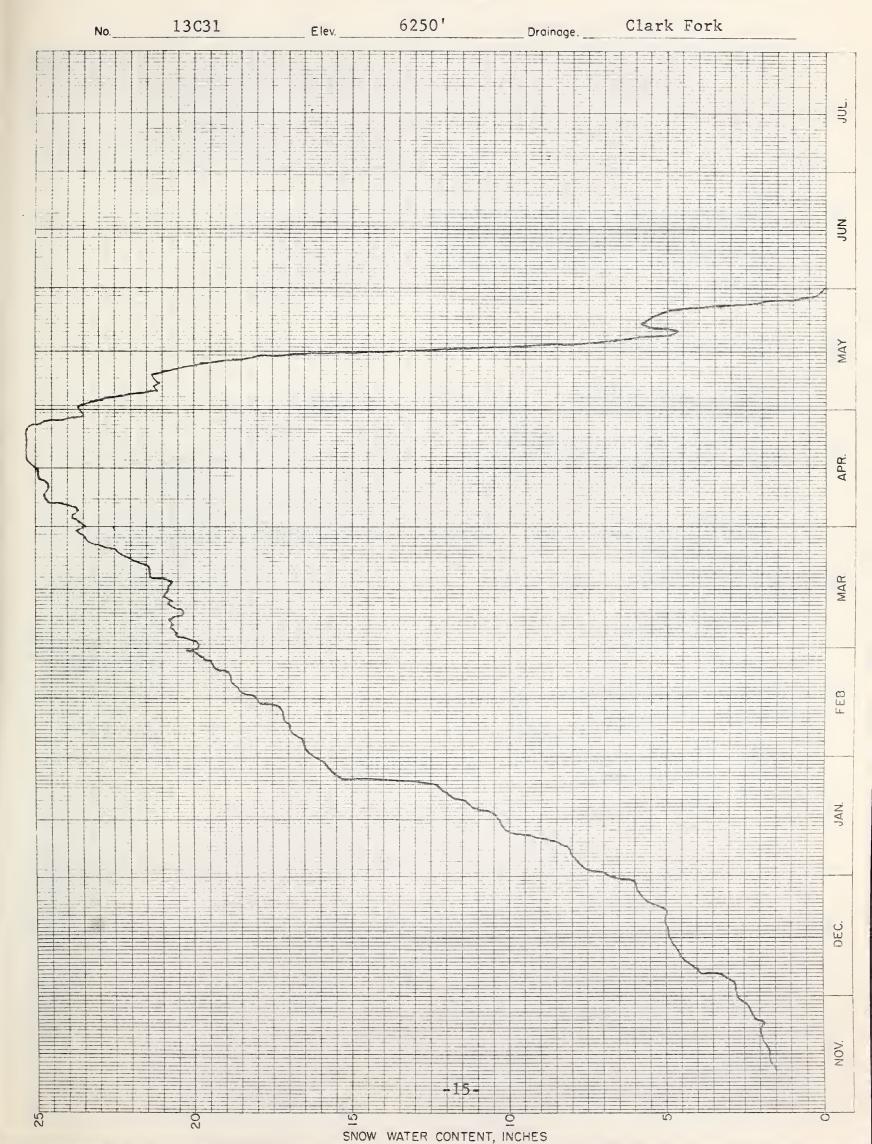


60001 Clark Fork 15C10 Elev. Drainage: \_ No. -13-SNOW WATER CONTENT, INCHES











7200' 13C36 Clark Fork Elev. Drainage. No.\_ JUL. JUN MAY DEC. NOV. -16-SNOW WATER CONTENT, INCHES



7900' 13D22 Bitterroot Drainage: \_\_

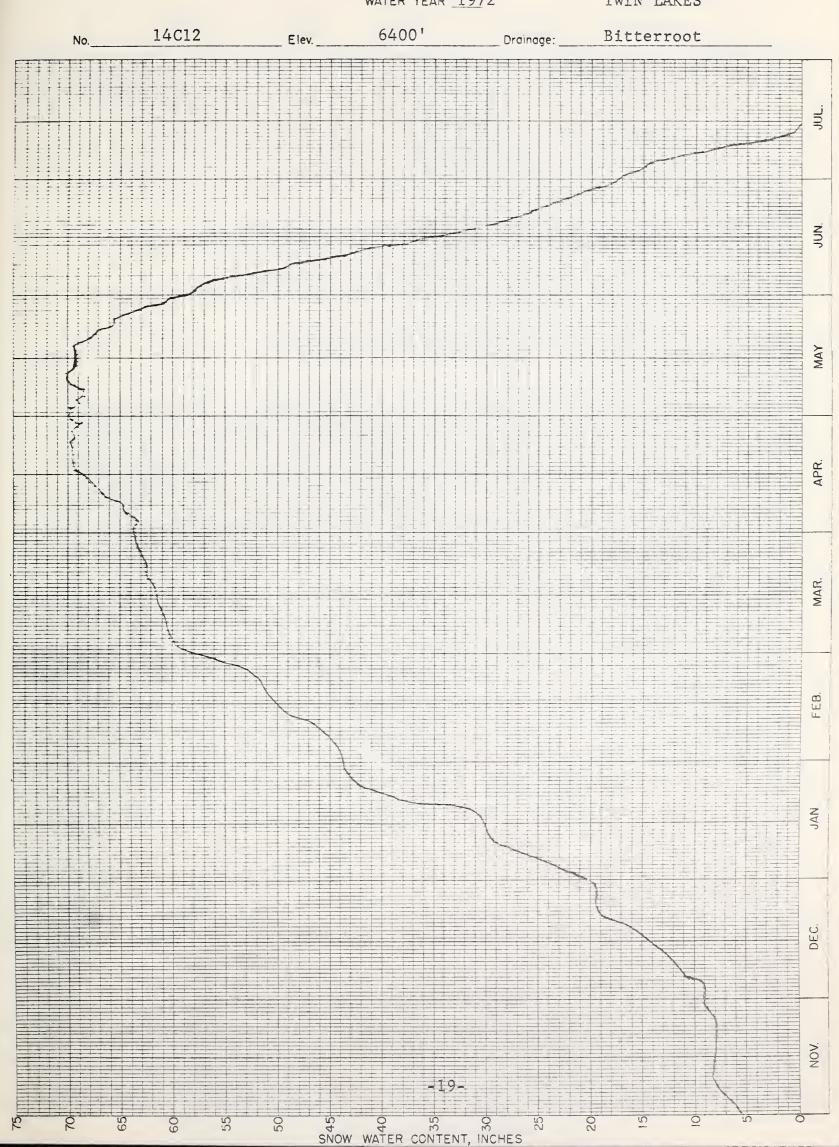


TWELVEMILE CREEK

5600 Drainage: 14C13 Bitterroot Elev. SNOW WATER CONTENT, INCHES

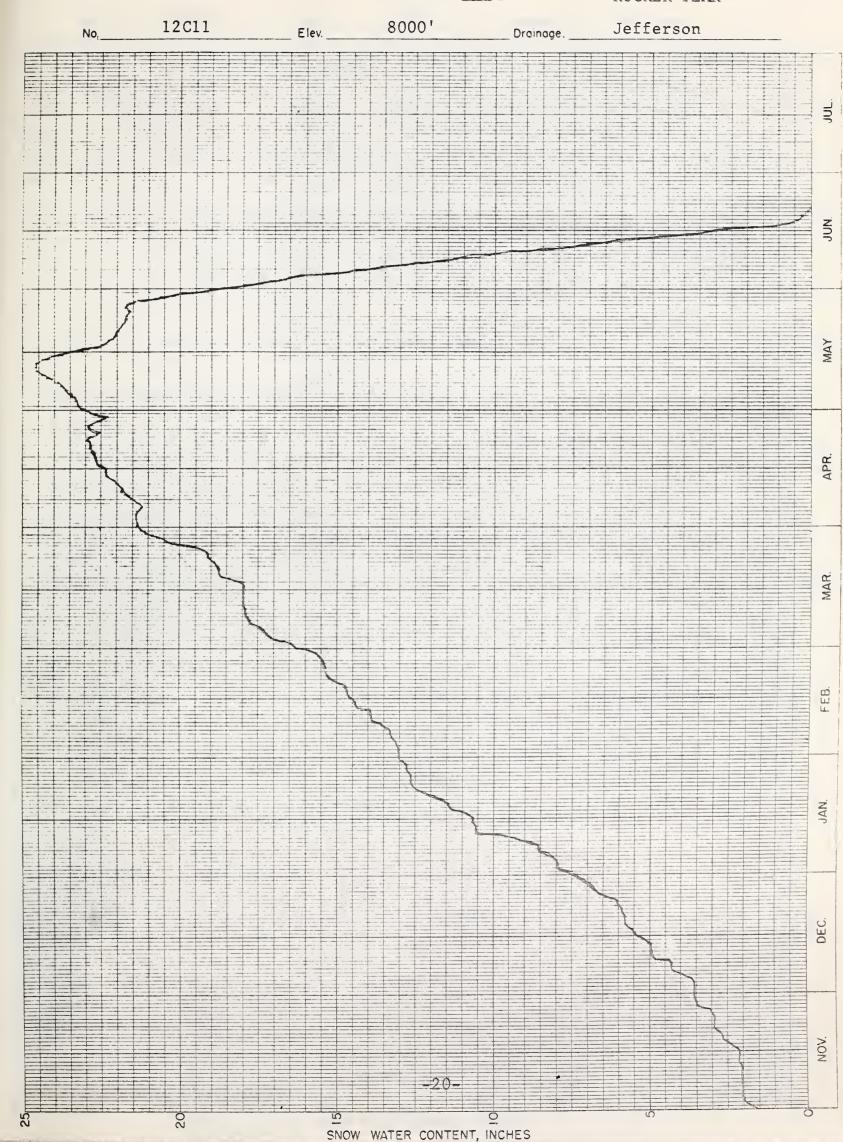


TWIN LAKES

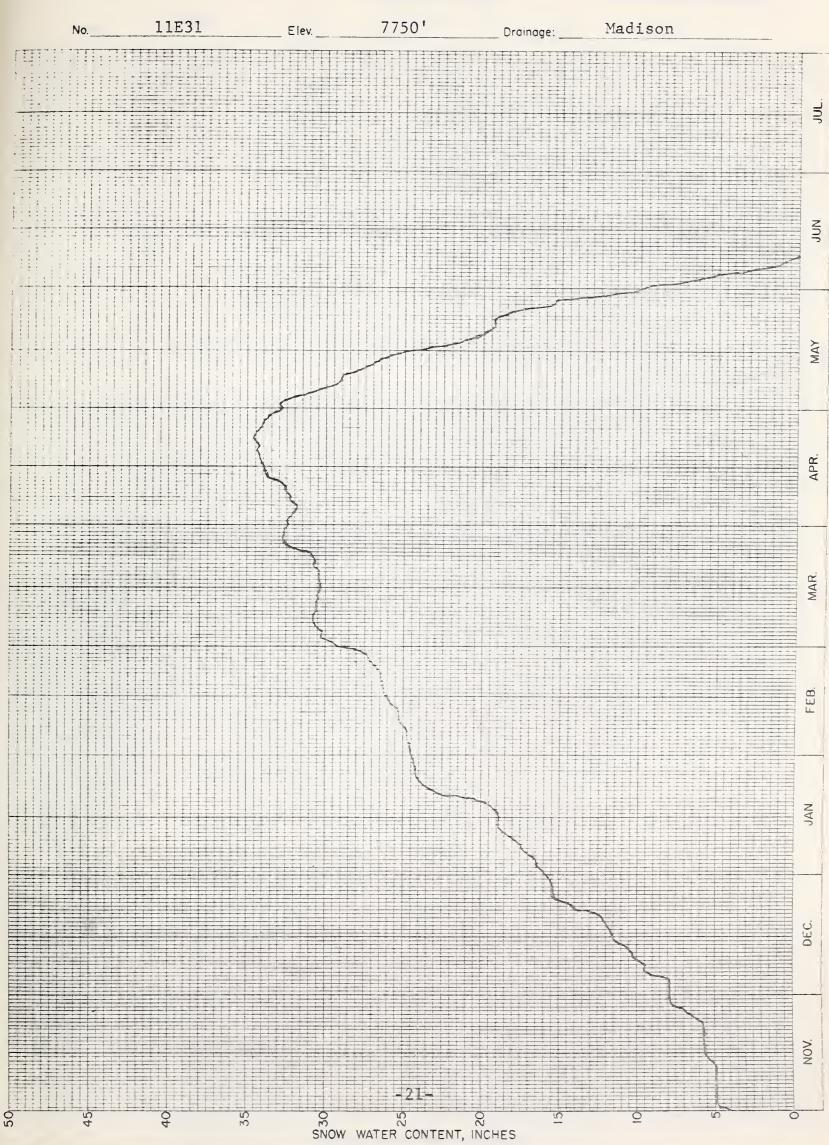




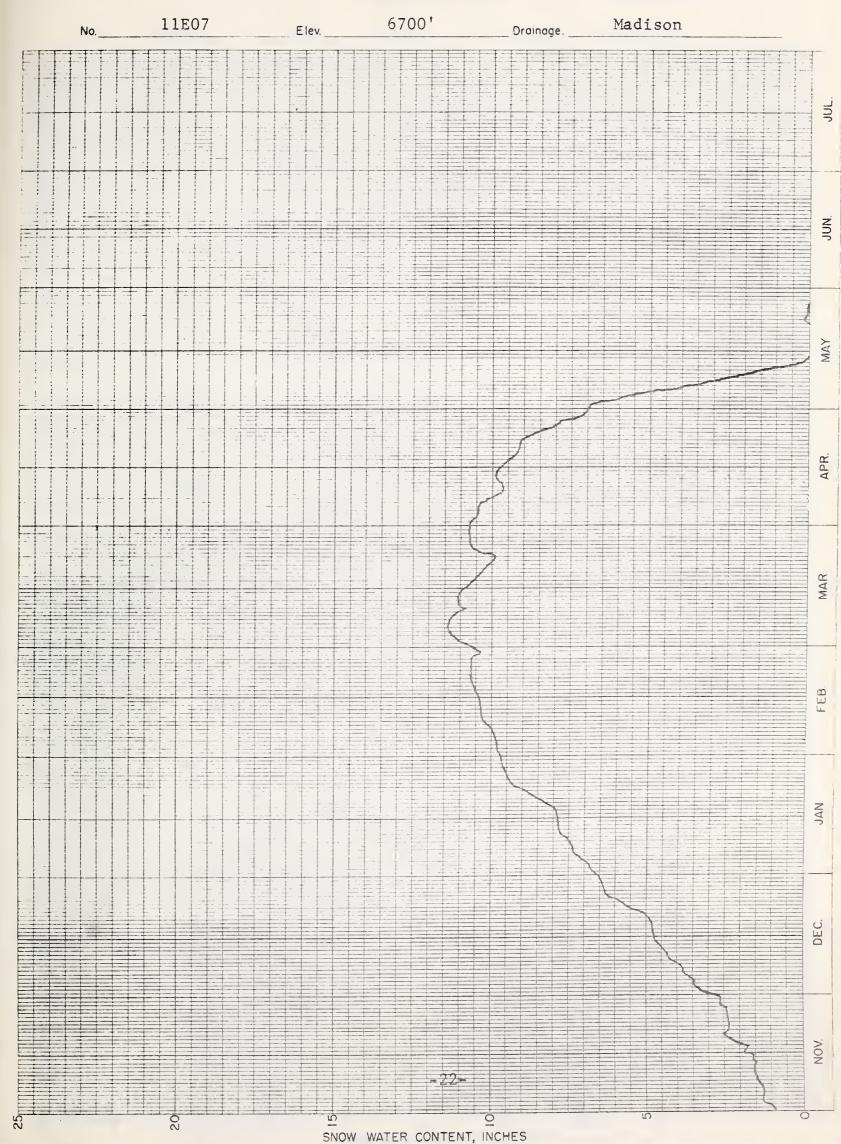
ROCKER PEAK











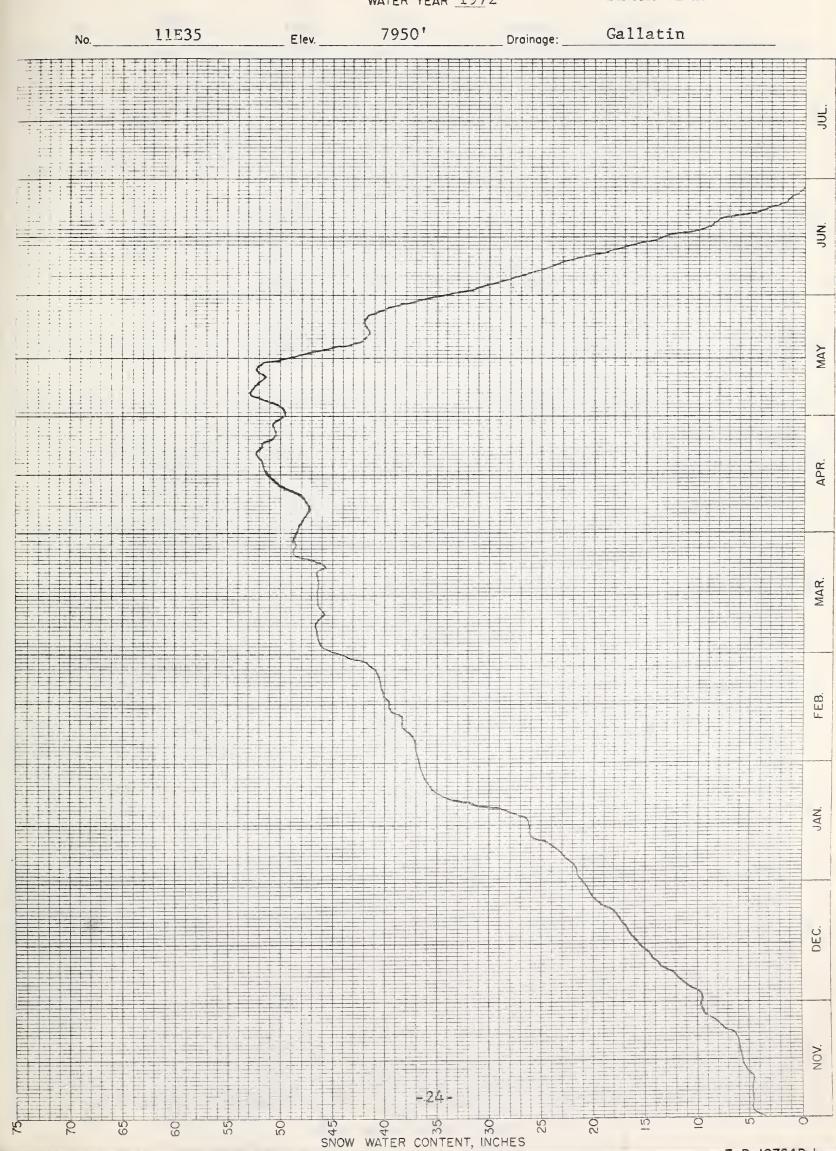


BANGTAIL

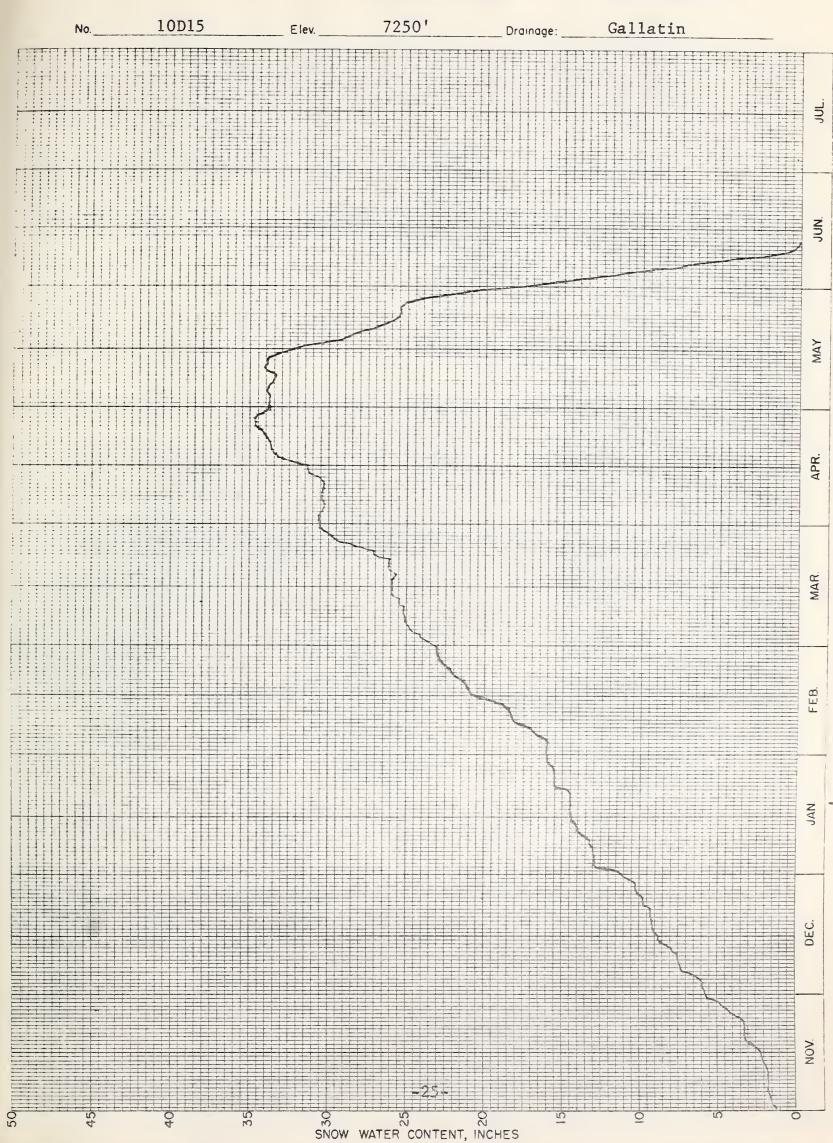
10D20 7900' Gallatin Elev. Drainage: SNOW WATER CONTENT, INCHES



BLACK BEAR



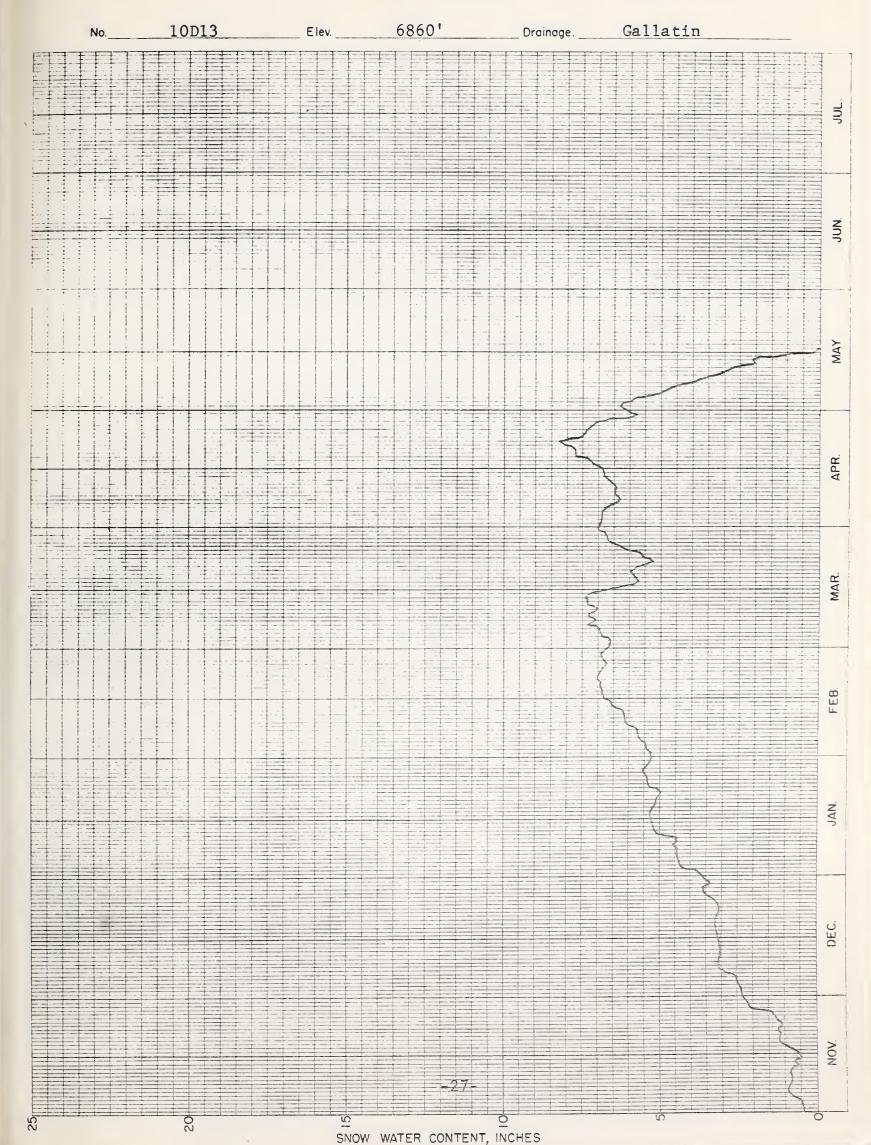




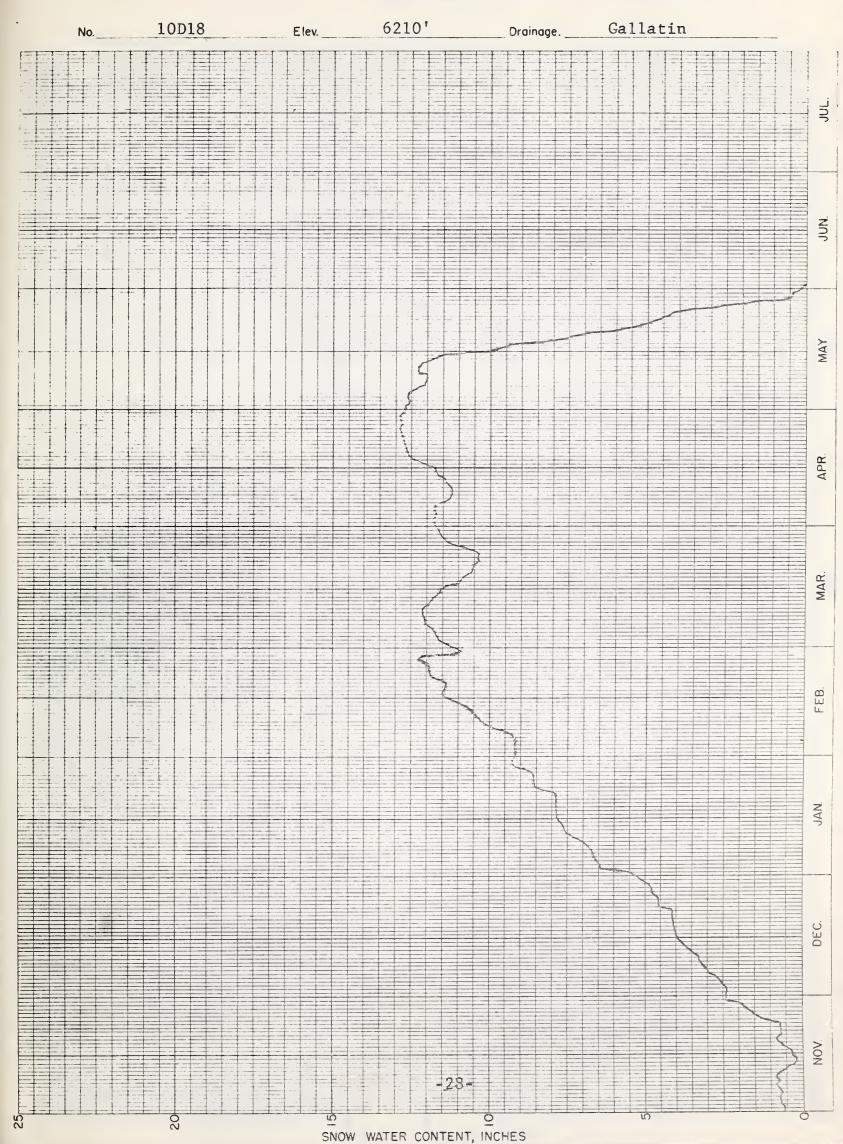


11E29 9000' Gallatin Drainage: Pillow Inoperative JAN SNOW WATER CONTENT, INCHES

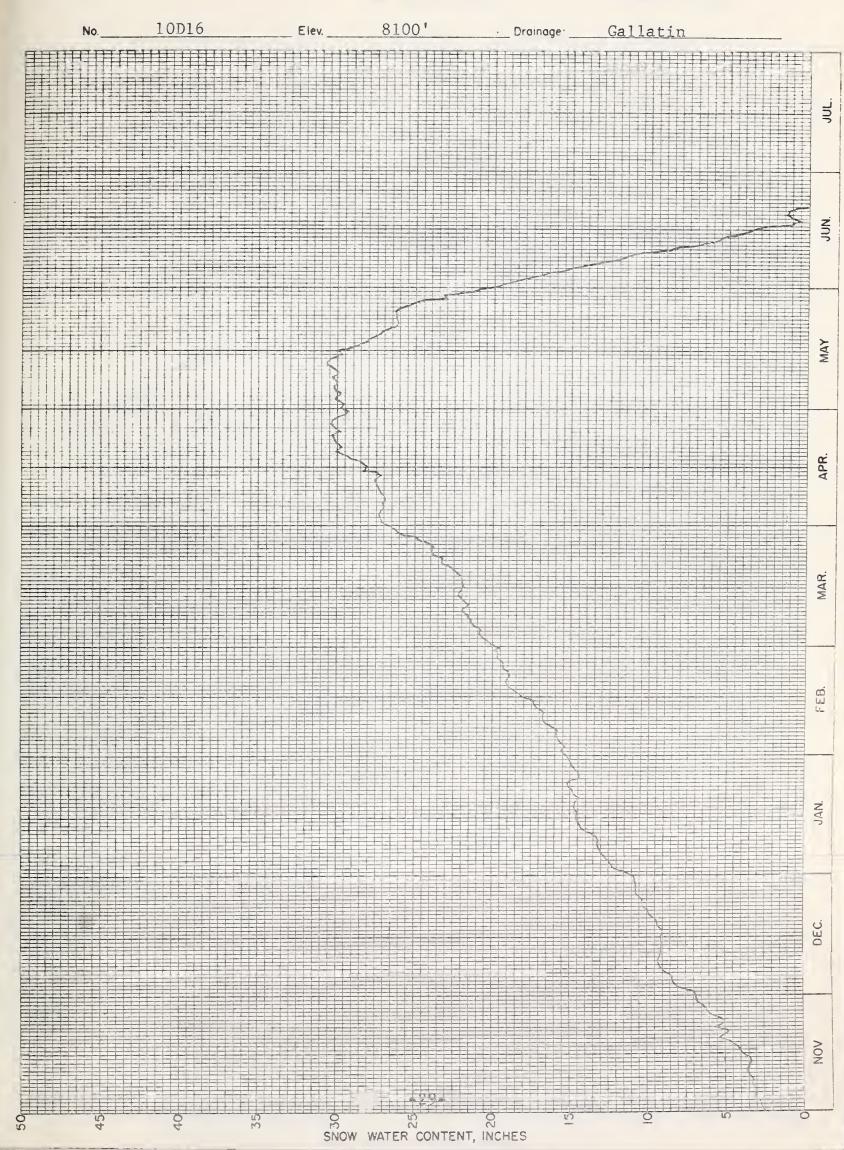




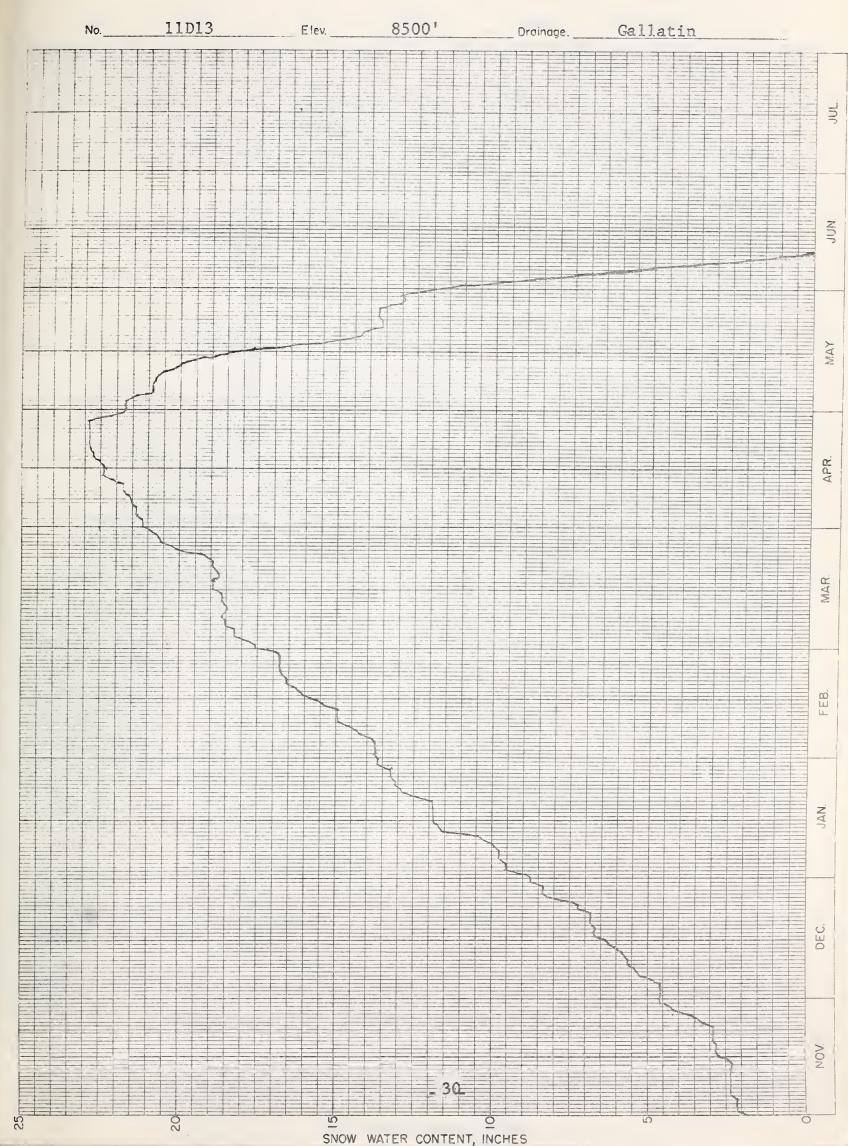












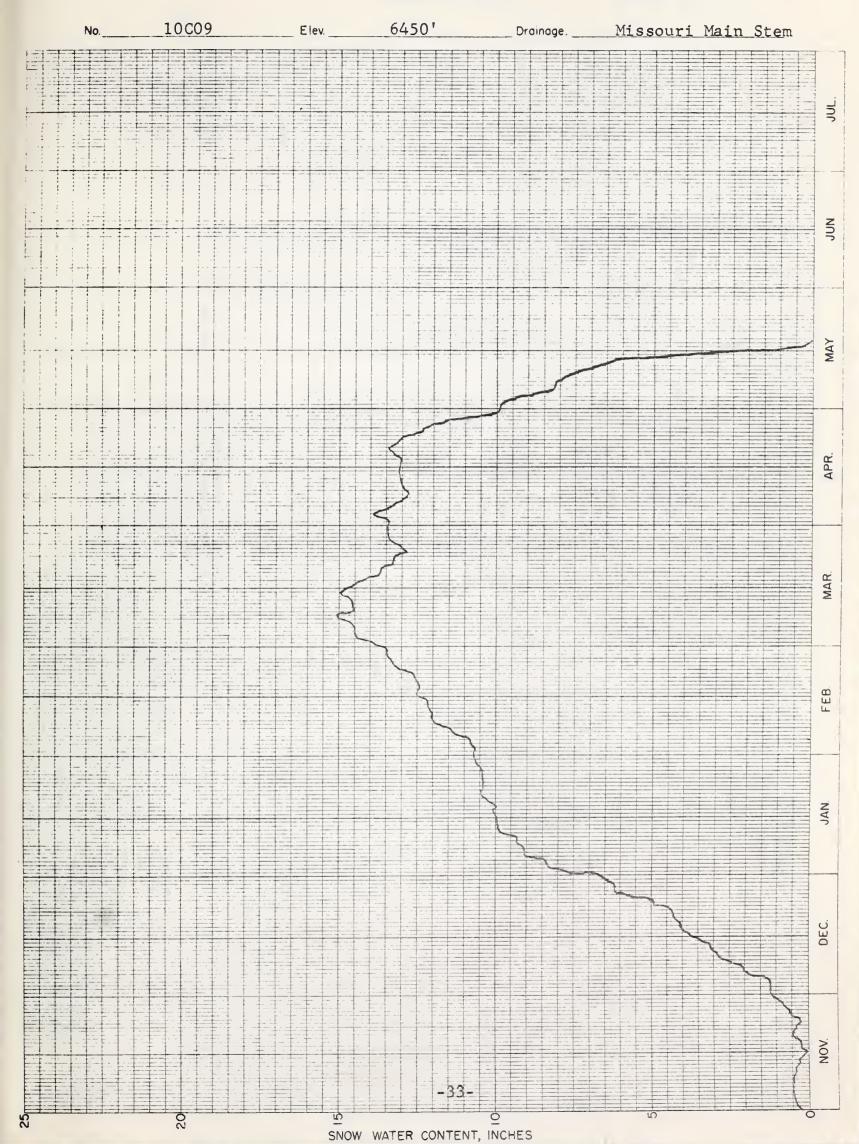


11E24 80001 Gallatin Elev. No.\_ Drainage. \_\_ JUL. Recorder MAY FEB. JAN. DEC. NOV **-31**-SNOW WATER CONTENT, INCHES



11E30 68001 Gallatin Drainage: MAY MAR JAN. DEC. NOV SNOW WATER CONTENT, INCHES

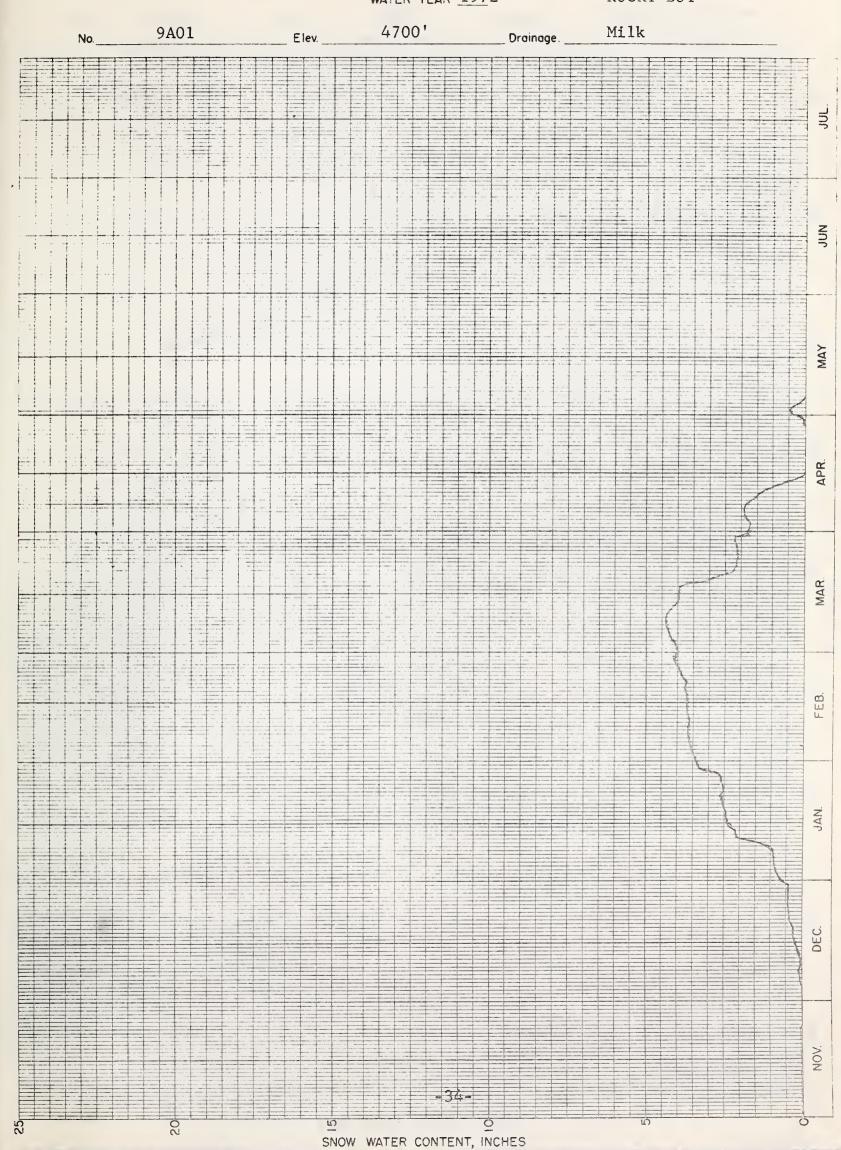




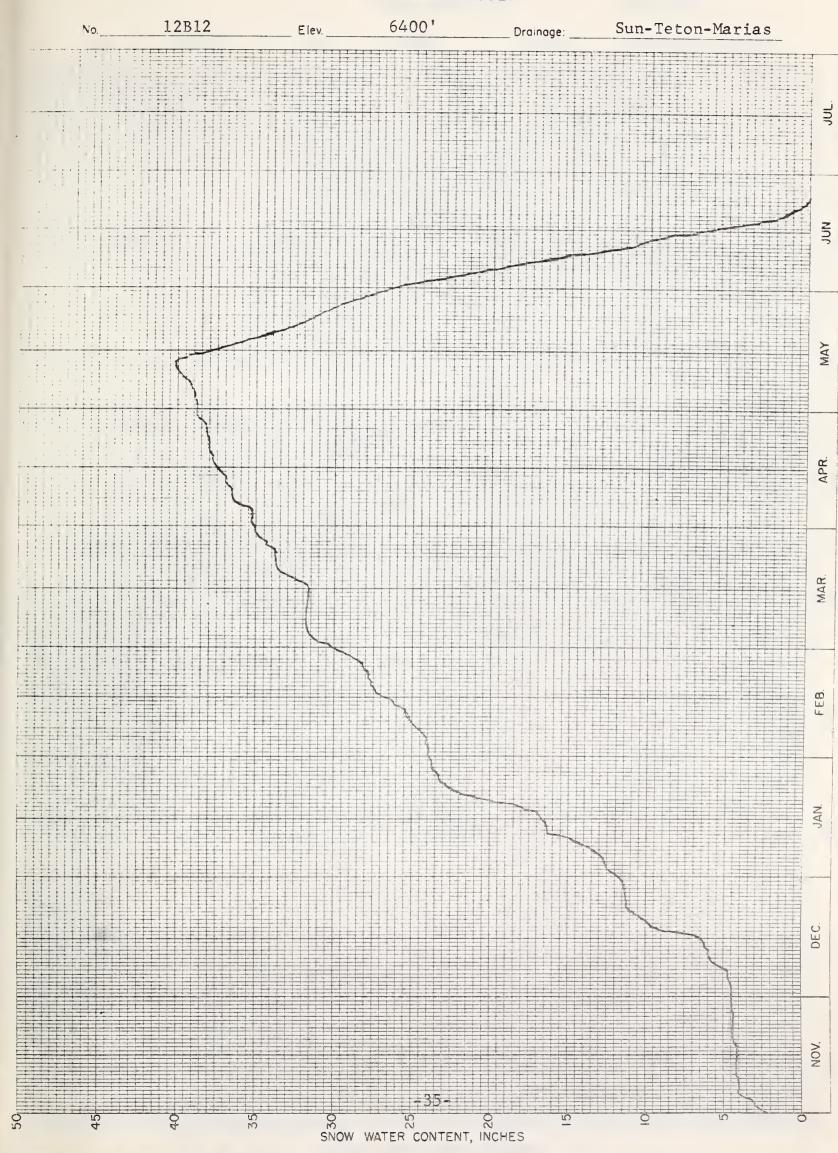


#### SNOW PILLOW DATA WATER YEAR 1972

ROCKY BOY



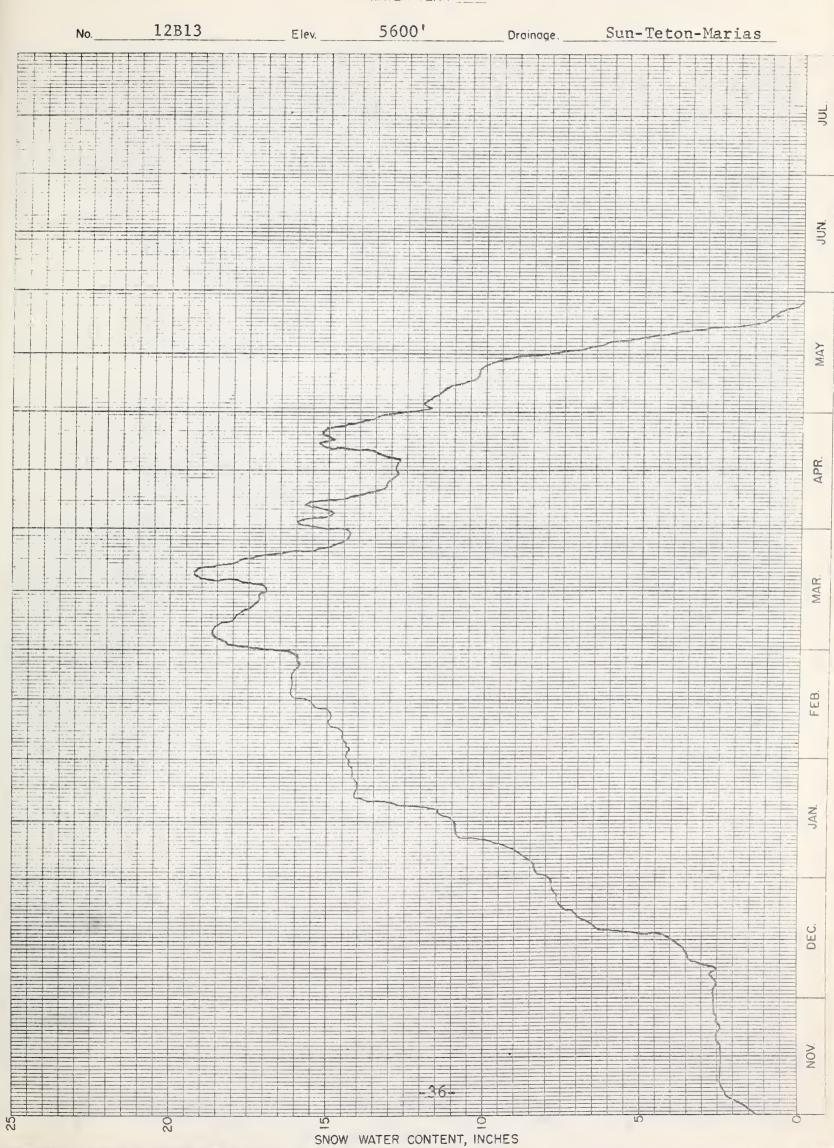






SNOW PILLOW DATA WATER YEAR 1972

WALDRON





80001 10C06 Judith Drainage: JAN

SNOW WATER CONTENT, INCHES

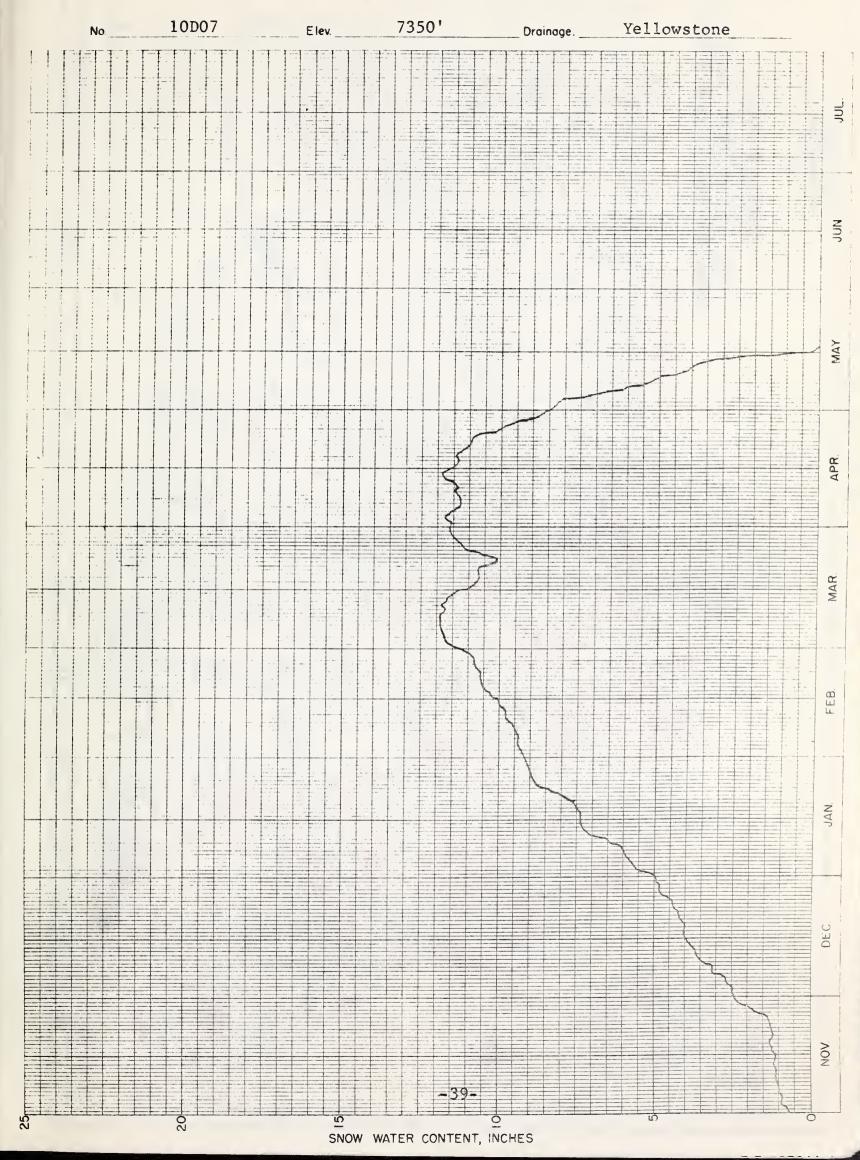


9D06 9100' Yellowstone Elev. No. Drainage: FEB. DEC. NOV SNOW WATER CONTENT, INCHES

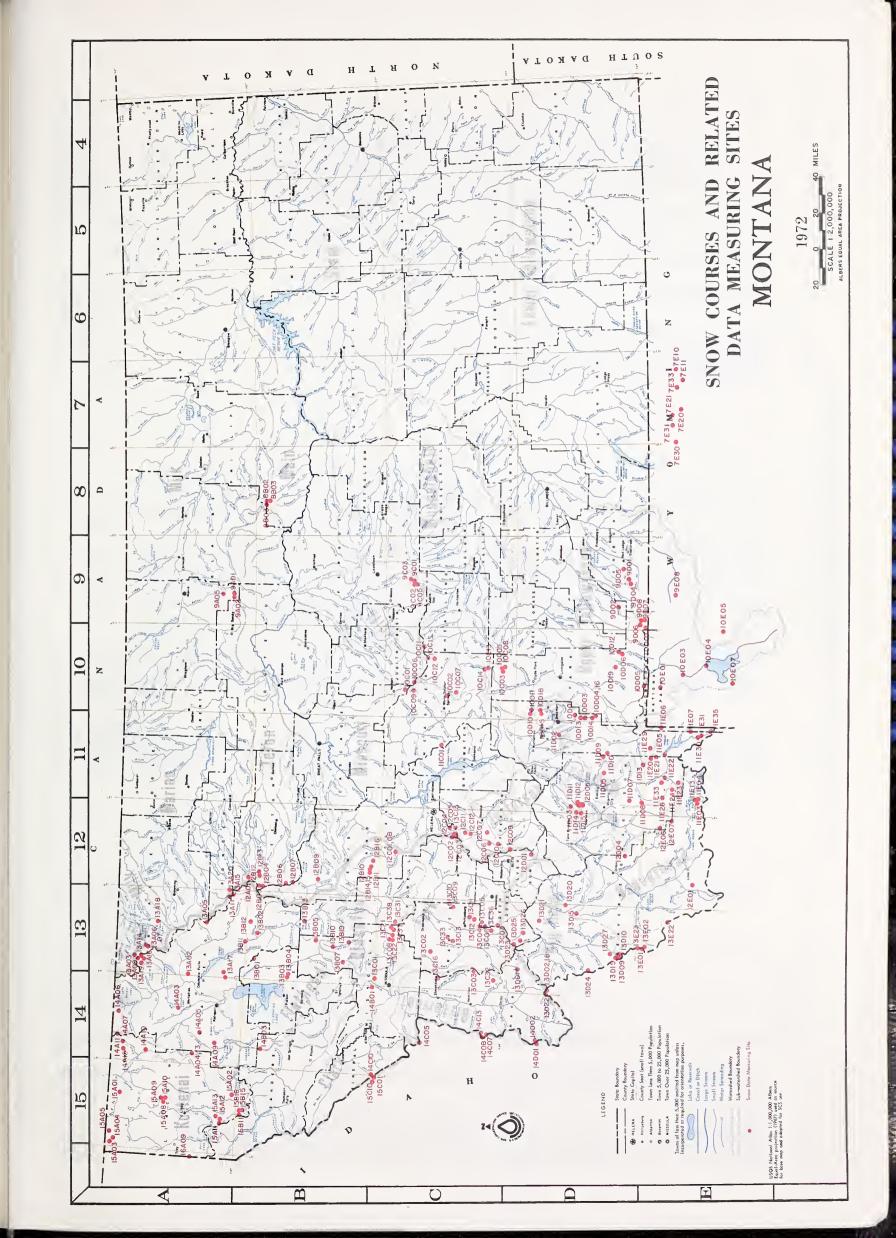


#### SNOW PILLOW DATA WATER YEAR 1972

NORTHEAST ENTRANCE







MOISTURE STATIONS	Meas. By 2/
MOL	Measuring Dates 1/
SOIL	Record
and	Tup. Range
COURSES	Sec
200	Elsv.
MONS	Number
MONTANA	Drainege Basin 5. Snow Course
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### Agencies and Organizations Cooperating in Montana Snow Surveys

#### GOVERNMENT AGENCIES

#### Canada:

Department of Energy, Mines and Resources, Alberta Water Investigations Branch, Department of Lands, Forests, and Water Resources, British Columbia

#### Federal:

Department of the Army Corps of Engineers

U.S. Department of Agriculture Forest Service Soil Conservation Service

U.S. Department of Commerce NOAA, National Weather Service

U.S. Department of the Interior
Bonneville Power Administration
Bureau of Indian Affairs
Bureau of Reclamation
Bureau of Sports Fisheries and Wildlife
Geological Survey
National Park Service

#### STATE

Montana Conservation Districts
Montana Water Resources Board
Montana State University - Agricultural Experiment
Station
North Montana Branch Station - Agricultural Experiment
Station
University of Montana - Schoól of Forestry

#### PRIVATE

Montana Power Company

Other organizations and individuals furnish valuable information for snow survey reports. Their cooperation is gratefully acknowledged.

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